Attorney Docket No. ORT-1414

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

---X

Re: U.S. PATENT APPLICATION
Serial Number 09/833,222

Filed: April 11, 2001 Art Unit 1647

---X

DECLARATION OF DR. NING QI UNDER RULE 37 CFR 1.131

1. I am a co-inventor of the application Serial Number 09/833,222, entitled "cDNA Encoding the Human Alpha2Delta-4 Calcium Channel Subunit" (the '222 application). I obtained my Ph.D. degree in July 1993, from Baylor College of Medicine, and had my postdoctoral training at University of California, Los Angeles from 1994-1997. From 1997 to 1999, I was employed as a research assistant professor at UCLA and then, as an Assistant Professor at University of Kentucky. I have been employed by Johnson & Johnson as a research scientist since September 1999. My resume is attached as Exhibit 1.

2. The invention described in the '222 application is based on the research my colleague and I conducted from 1999 to 2000, during which we successfully cloned the human $\alpha_2\delta$-4 calcium channel subunit, as evidenced by the data in my laboratory notebook. I attach the relevant notebook pages (Exhibits 2 and 3) and a computer printout (Exhibit 4) herewith to demonstrate the process of our invention. This was completed long before the Brown and Bertelli's publication (March 22, 2001, WO 01/19870A2).

3. I was interested in cloning this subunit because the voltage gated calcium channel is one of important pain therapeutic targets as recognized by the scientists in the field of pain control. I believe that the $\alpha_2\delta$ is a key regulatory subunit and that there are multiple $\alpha_2\delta$ isoforms, based on our analysis on human genomic DNA data, all play an important role in mediating Ca^{2+} influx in excitable cells.

4. I started the project of cloning $\alpha_2\delta$–4 on or about September 20, 1999 (Exhibit 12. No. 15798-1) and my colleague and I continuously worked on the project for the next several months. Because the cDNA encoding $\alpha_2\delta$-4 subunit is more than 3Kb, I had to clone it piece by piece. (Exhibit 2). We ultimately assembled and sequenced the fully length cDNA of $\alpha_2\delta$-4 subunit by April 7, 2000, which was recorded in my lab notebook (Exhibit 3, p. No. 15798-139), and the DNA and protein sequence information were also documented in both Microsoft word and Seqweb files on the same day. (Exhibit 4).

I declare under the penalty of perjury that the above statements are true and accurate to the best of my knowledge.

Dated: June 6, 2006

By: Ning Qin, Ph.D.

CURRICULUM VITAE

[04-30-2006]

Ning Qin

SITE:	Spring House
DIVISION:	Analgesics
DEPARTMENT:	Drug Discovery
EDUCATION:	Baylor College of Medicine, Houston, Texas 1993, Biochemistry, Ph.D.

EMPLOYMENT

1999-present Johnson & Johnson Pharmaceutical Research and Development
Spring House, PA
2003-Present Principal Scientist, Analgesics, Drug Discovery
1999-2002 Senior Scientist

1999- Department of Pharmacology, University of Kentucky
Lexington, KY 40536
1999-1999 Assistant Professor

1994-1998 Dept. of Anesthesiology UCLA. School of Medicine,
Los Angeles, CA 90095
1997-1998 Research Assistant Professor
1994-1996 Postdoctoral Fellow

CURRENT PROFESSIONAL AFFILIATIONS

1. Society of Neuroscience
2. Biophysical Society
3. American Pain Society
4. International Association for the study of Pain
5. New York Academy of Sciences

PUBLICATIONS

Manuscripts

1. **N. Qin,** S. J. Pittler and W. Baehr, (1992) "*In Vitro* Isoprenylation and Membrane Association of Mouse Photoreceptor cGMP Phosphodiesterase α and β subunits Expressed in Bacteria", ***Journal of Biological Chemistry,*** 267, 8458-63

2. **N. Qin** and W. Baehr, (1993) "Expression of Mouse Rod Photoreceptor PDE γ Subunit in Bacteria", ***FEBS Letters,*** 321, 6-10

3. M. L. Suber, S. J. Pittler, **N. Qin,** G. C. Wright, V. Holcombe, R. H. Lee, C. M. Craft, R. N. Lolley, W. Baehr and R. L. Hurwitz, (1993) "Irish Setter Dogs Affected with Rod/Cone Dysplasia Contain a Nonsense Mutation in the Rod cGMP Phosphodiesterase β Subunit Gene", ***Proc. Natl. Acad. Sci. U.S.A.*** 90, 3968-3972

4. **N. Qin** and W. Baehr, (1994) "Expression and Mutagenesis of Biologically Active Mouse Rod Photoreceptor cGMP Phosphodiesterase", ***Journal of Biological Chemistry,*** 269 3265-3271

5. T. Schneider, X. Wei, R. Olcese, J. L. Costantin, A. Neely, P. Palade, E. Peryes, **N. Qin,** J. Zhou, G. Crawford, R. G. Smith, S. H. Appel, E. Stefani and L. Birnbaumer (1994) "Molecular analysis and functional expression of the human type E neuronal Ca^{2+}-channel α_1 subunit", ***Receptors and Channels,*** 2, 255-270

6. R. Olcese, **N. Qin** ***(Co-first author),*** T. Schneider, A. Neely, X. Wei, E. Stefani and L. Birnbaumer (1994) "The Amino Terminus of a Calcium Channel β subunit Sets Rates of Channel Inactivation Independently of the Subunit's Effect on Activation", ***Neuron,*** 13, 1433-1438

7. F. Noceti, P. Baldelli, X. Wei, **N. Qin,** L. Toro, L. Birnbaumer and E. Stefani (1996) "Effective Gating Charges Per Channel in Voltage Dependent K^+ and Ca^{2+} Channels", ***J. Gen. Physiol.*** 108, 143-155

8. **N. Qin**, R. Olcese , J. Zhou O. Caballo, L. Birnbaumer and E. Stefani (1996) "Identification of a second region of the β subunit involved in regulation of calcium channel inactivation", ***Am. J. Physiol. (Cell Physiology),*** 271:C1539-C1545

9. R. Olcese, A. Neely, **N. Qin**, X. Wei, L. Birnbaumer and E. Stefani (1997) "Coupling Between Charge Movement and Pore Opening in Neuronal α_{IE} Calcium Channel." ***J. Physiol.*** 497, 675-686

10. E. Tareilus, M. Roux, **N. Qin,** R. Olcese, J. Zhou E. Stefani and L. Birnbaumer (1997) "A Functional Calcium channel β subunit is Expressed in *Xenopus* Oocytes", ***Proc. Natl. Acad. Sci. U.S.A.*** 94, 1703-1708

11. J. Zhou R. Olcese, **N. Qin**, E. Stefani and L. Birnbaumer, (1997) "Feedback inhibition of calcium channels by calcium depends on a short sequence of the carboxyterminus that does not include the Ca^{2+} binding function of a motif with similarity to calcium binding domains", ***Proc. Natl. Acad. Sci. U.S.A.*** 94, 2301-2305

12. **N. Qin**, D. Platano, R. Olcese, E. Stefani and L. Birnbaumer (1997) "Inhibition of Neuronal Ca^{2+}Channel G-protein Coupled receptors Mediated by a Small C-terminal $G\beta\gamma$ Binding Domain of α_1", ***Proc. Natl. Acad. Sci. U.S.A.*** 94, 8866-887.

13. J. Costantin, F. Noceti, **N. Qin,** X. Wei, L. Birnbaumer and E. Stefani, (1998) "Facilitation by the β Subunit of Pore Openings in Cardiac Ca^{2+} Channels", ***J. Physiol.*** 507, 93-103

14. F. Noceti, R. Olcese, **N. Qin,** and E. Stefani, (1998) "Ca^{2+}-dependent inactivation in α_{1C} Ca^{2+} channels: effect of Bay K 8644(-) and the β_{2a} subunit. A model", ***J. Gen. Physiol.*** 111, 463-475

15. **N. Qin**, R. Olcese, E. Stefani and L. Birnbaumer (1998) "Modulation of human neuronal α_{1E} type calcium channel by $\alpha_2\delta$ subunit", ***Am. J. Physiol. (Cell Physiology),*** 274, C1324-C1331

16. **N. Qin,** Platano, R. Olcese, J. Costantin, E. Stefani and L. Birnbaumer (1998) "Unique regulatory properties of type 2a Ca^{2+} channel β subunit due to palmitoylation", ***Proc. Natl. Acad. Sci. U.S.A***,95, 4690-4695

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18. J. Costantin, **N. Qin,** L. Birnbaumer and E. Stefani, (1998) "Long lasting voltage-dependent facilitation of a cardiac and brain calcium channel: correlation with the coupling efficiency between charge movement and pore opening", **FEBS Letter,** 423, 213-217

19. M. Ottolia, D. Platano, **N. Qin** M. Birnbaumer, L. Toro, L. Birnbaumer, E. Stefani and R. Olcese (1998) "Functional Coupling Between Human E-type Ca^{2+} Channels and μ Opioid Receptors Expressed in *Xenopus* Oocytes"; **FEBS Letter,** 427, 96-102

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21. **N. Qin,** R. Olcese, M. Bransby, T. Lin, and L. Birnbaumer (1999) "Ca^{2+}-induced inhibition of the cardiac Ca^{2+} channel depends on calmodulin". ***Proc. Natl. Acad. Sci. U S A***; 96(5): 2435-8

22. B. Vannier, M. Peyton, G. Boulay, D. Brown, **N. Qin,** M. Jiang, X. Zhu, and L. Birnbaumer (1999) "Mouse trp2, the homologue of the human trpc2 pseudogene, encodes mTrp2, a store depletion-activated capacitative Ca^{2+} entry channel" ***Proc. Natl. Acad. Sci. U S A***; 96(5): 2060-4

23. G. Boulay, D. M. Brown, **N. Qin** ***(Co-first author)***, M. Jiang, A. Dietrich, M. X. Zhu, Z. Chen, M. Birnbaumer, K. Mikoshiba, and L. Birnbaumer (1999) "Modulation of Ca^{2+} entry by polypeptides of the inositol 1,4,5-trisphosphate receptor (IP3R) that bind transient receptor potential (TRP): Evidence for roles of TRP and IP3R in store depletion-activated Ca^{2+} entry" ***Proc. Natl. Acad. Sci. U S A***; 96: 14955-14960.

24. D. Platano, **N. Qin,** F. Noceti, L. Birnbaumer, E. Stefani, and R. Olcese (2000) "Expression of alpha2delta Subunit Interferes with Prepulse Facilitation in Cardiac L-type Calcium Channels" ***Biophys. J.*** 78 2959-2972

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26. **N. Qin**, S. Yagel, M. Momplaisir, E. E. Codd and M. R. D'Andrea (2002) "Molecular cloning and characterization of human voltage-gated calcium channel $\alpha_2\delta$-4 subunit" ***Molecular Pharmacology,*** *62 (3)*

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28. **N. Qin,** M. D'Andrea, M. Lubin, N. Shafaee, E. Codd and A. Correa (2003) "Cloning and Characterization of a novel splicing variant of human sodium channel β_1 subunit". ***The FEBS Journal (European Journal of Biochemistry), 270:*** *4762-4770*

29. R. Pagani, M. Song, M. McEnery, **N. Qin**, R. W. Tsien, L. Toro, E. Stefani and O. D. Uchitel (2004) "Differential expression of alpha 1 and beta subunits of voltage dependent Ca^{2+} channel at the neuromuscular junction of normal and P/Q Ca^{2+} channel knockout mouse". ***Neuroscience: 123 (1)***: 75-85

30. **N. Qin**, SP Zhang,, T.L. Reitz, J.M. Mei and C.M. Flores (2005) "Cloning, Expression and Functional Characterization of Human COX-1 Splicing Variants: Evidence for Intron 1 Retention" ***The Journal of Pharmacology and Experimental Therapeutics, 315 (3):*** *1298-1305*

31. Y. Liu, M. Lubin, T.L. Reitz, Y. Wang, R.W. Colburn, C.M. Flores and **N. Qin** (2006) "Molecular identification and functional characterization of a temperature-sensitive transient receptor potential channel (TRPM8) from canine" ***European Journal of Pharmacology, 530:*** *23-32*

32. Y. Liu, **N. Qin,** T.L. Reitz, Y. Wang and C.M. Flores (2006) "Inhibition of the rat brain sodium channel Nav1.2 after prolonged exposure to gabapentin" ***Epilepsy Research 69 (3):***

Book Chapters

1. L. Birnbaumer, **N. Qin**, R. Olcese, E. Tareilus and E. Stefani, (1998). "Studies on the regulation of the human neuronal calcium channel by β and $\alpha_2\delta$ subunits". ***Low voltage activated T-type calcium channels***, 258-268, Montpellier, France

2. F. Noceti, R. Olcese, P. Baldelli, **N. Qin,** L. Birnbaumer and E. Stefani, (1998) "Charges per channel in Ca^{2+} channels: effect of the regulatory β subunit co-expression on α_1 pore forming subunit". ***Low voltage activated T-type calcium channels***, 307-313, Montpellier, France

3. R. Olcese, F. Noceti, P. Baldelli, **N. Qin,** L. Birnbaumer and E. Stefani, (1998) "β subunit modulation of the coupling between charge movement and pore opening in calcium channels". ***From Ion Channels to Cell to Cell Conversation***, 91-104, Plenum press, New York and London

4. L. Birnbaumer, **N. Qin**, R. Olcese, E. Tareilus, Daniela Platano and E. Stefani, (1998) Structures and Functions of Calcium Channel β Subunits." ***J. of Bioenergetics and Biomembranes,*** Vol. 30(4) 357-375

5. L. Birnbaumer, G. Boulay, D. Brown, M. Jiang, A. Doetrich, K Mikoshiba, X. Zhu, and **N. Qin**, (2000) "Mechanism of Capacitative Ca^{2+} entry (CCE): Interaction between IP3 Receptor and TRP links the Internal Calcium Storage Compartment to Plasma Membrane CCE Channels." ***Recent Progress in Hormone Research, Vol. 55:*** 127-162

ABSTRACTS

1. Y. Liu, M.L. Lubin, T. Reitz, R.W. Colburn, C.M. Flores, and **N. Qin** "Cloning and functional characterization of a canine transient receptor potential channel, cTRPM8". 2004 Neuroscience Meeting
2. **N. Qin**, S-P. Zhang, T. Reitz, E. E. Codd and C. M. Flores "Human COX-3? Cloning and Characterization of a splicing variant of COX-1" 2004 Neuroscience meeting
3. **N. Qin,** M. Neeper, Y. Liu and C. M. Flores "Characterization of calcium channel beta subunit interaction domain" 2005 International Association for the Study of Pain Annual Meeting

PATENTS

1. **N. Qin,** E. Codd, and M. D'Andrea (2006) "The Human Voltage Gated Sodium Channel β_{1A} Subunit And Method Of Use." ***US 6994,993 B2***

2. **N. Qin** and E. Codd (2003) "cDNA encoding the human alpha2delta-4 calcium channel subunit" US20030166045 A1

3. **N. Qin**, E. Codd C. M. Flores and SP. Zhang (2004) "Human cyclooxygenase-3 enzyme and uses thereof" US20040235017 A1

4. C. M. Flores, Y. Liu, M. Lubin and **N. Qin** (2006) "Canine Cold- And Menthol-Sensitive Receptor 1" ***US20060014246 A1***

5. **N. Qin**, Y. Liu, M. Neeper, T. Reitz and C. M. Flores (2005) "Compositions and Methods for Identifying Modulators of TRPV2" Provisional filing

6. **N. Qin**, Y. Liu and C. M. Flores (2005) "A Polypeptide Complex of TRPM8 and Calmodulin And Its Uses Thereof" Provisional filing

DOCUMENT ID
NO. 4368708

BOOK No. 15798

R.W. Johnson Pharmaceutical Research Institute

Issued to Ning Qin

Department Anegiscs Code 62333.

Covering the Period 9/7/99 to 6/20/2000

Transferred to ______ Date ______

Project No. α2δ of ca²⁺ channel Protocol / Experiment No. Date 9/20/99

Subject Purpose cloning

Contd. from page

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Questions or comments? Write to the NCBI Help Desk.

Contd. on page Investigator Qing Qin Date 9/28/99

Read and Understood Ellen Codd Date 100799

No. 15798- 6

Project No. $\alpha_2\delta$ Protocol / Experiment No. Date 9/28/99

Subject Purpose

Contd. from page 5

Analysis and Comparison of other small fragments of $\alpha_2\delta$ identified on 9/20/99.

Two fragments are novel $\alpha_2\delta$. name them to $\boxed{\alpha_2\delta\text{-}4}$.

they are H86016

g1436938.

Two are human $\alpha_2\delta$-3 fragments.

they are g3805345

g2885043. or AA001473

sequence comparison result of H86016

& g1436938

are saved in

H:/mydata/gene/$\alpha_2\delta$/new-$\alpha_2 d$.

Contd. on page 5 Investigator [signature] Date 10/1/99

Read and Understood E Codd Date 100799

No. 15798- 8

Project No. $\alpha_2\delta$. Protocol / Experiment No. Date 9/30/99

Subject Purpose

Contd. from page 7

1. comparison of 208672.2
   199408.3
   with mouse $\alpha_2\delta$-3.

   same as H:/mydata/gene/a2d/Incyte clone 208672
   Incyte clone 199408.

2. Design oligos.

   A2-3-5
   -6
   -7
   -8
   -9
   -10

   $\Big\}$ for clone human $\alpha_2\delta$-3.

   A2-4-1
   -2
   -3
   -4
   -5

   $\Big\}$ for clone human $\alpha_2\delta$-4.

Contd. on page 6 Investigator [signature] Date 10/1/99

Read and Understood E Cohh Date 100799

No. 15798- 25

Project No. α2δ & Na-β1A Protocol / Experiment No. .... Date 10-2-99

Subject .... Purpose ....

Contd. from page ____

1. Race PCR to amplify NT of hα2δ-4.

Marathon Ready library ① fetal human brain

② human brain.

RX. 5ul 10x Buffer.

5ul cDNA library.

1ul AP1.

1ul A2-4-9 (10 pmol/ul).

1ul Advance Taq.

1ul 10mM dNTP.

36ul H_2O

cycles. 94°c /30"

↓

94°c /5"] 5 cycles.

↓

72°c /4 min

↓

94°c /5"] 5 cycles.

↓

70°c /4 min

↓

94°c /5"] 25 cycles.

↓

68°c /4 min

↓

4°c / parking.

Contd. on page 22 Investigator [signature] Date 11/16/99

Read and Understood [signature] Date 3-6-00

No. 15798- 28

Project No. α2δ + Na-β1A Protocol / Experiment No. Date 11-8-99

Subject Purpose

Contd. from page

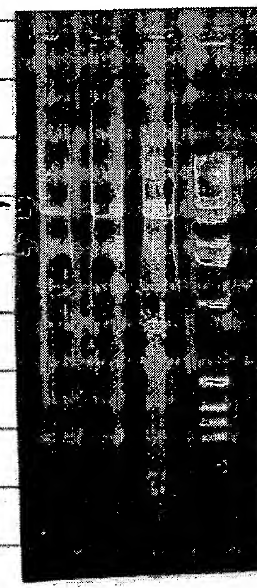
1. cloning Race PCR product (11-5-99) of NT α2δ-4 (human)

(1) gel purification
cut two parts.

A. 3Kb band

B 2-2.5Kb bands

purify them separately



(2). polish them.

(3) Ligation pBscript.

(4) transform to XL10-gold

2. Retest condition for Na-β1A.

RX 50 ul. with Advantage Taq

(1) SB1-4 + SB1-2.
(2) SB1-5 + SB1-2 } rat brain cDNA

(3) SB1-1 + SB1-2
(4) SB1-5 + SB1-2 } human brain cDNA.

condition: 30 cycles.

94°C/30" → $\boxed{58°C/30"}$ → 72°C/60"

5ul to check PCR RX.

does not work.

Contd. on page 25

Investigator Date 11/16/99

Read and Understood Date 3-6-00

No. 15798- 33

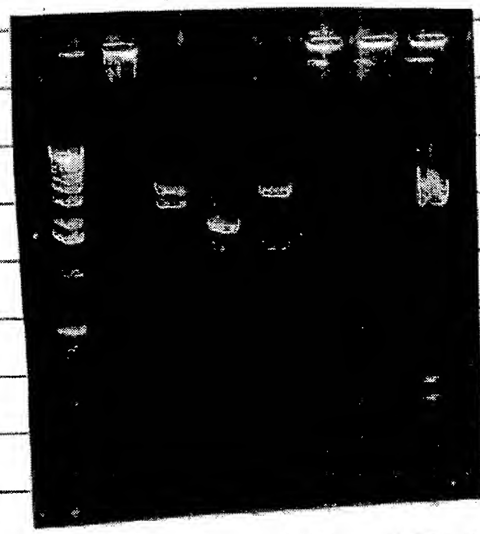
Project No. d2 8. Protocol / Experiment No. Date 11-11-99

Subject Purpose

Contd. from page

1. miniprep NQC44.
two new 3Kb α2δ-4 in pCR2.1
four new 2kb α2δ-4 in pCR2.1
dig. NQC44 with EcoRI + NotI
all others with EcoRI only

3-1 3-2 2-1 2-2 2-3 2-4 NQC44.

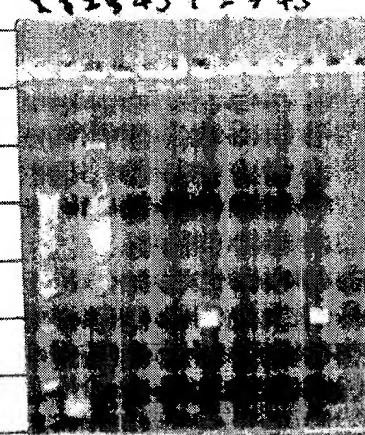


3-2, 2-1, & 2-2
have insertion
3-2 → NQC45
2-1 → NQC46
2-2 → NQC47

Send NQC44-47
for seq.

2. characterise these clones. by PCR. T7+A2-4? Rev+A2-4?
① NQC44, ② NQC45, ③ NQC46
④ NQ47, ⑤ Incyte 3343141.
20 ul RX.
NQC44 & 45 are very promising
but 44 is too short.
45 is right size.

12345 12345



Contd. on page 32 Investigator [signature] Date 11/16/99

Read and Understood [signature] Date 3-6-00

Project No. α₂8. Protocol / Experiment No. .... Date 11-11-99

Subject .... Purpose ....

Contd. from page ____

1. miniprep NQC44.
   two new 3Kb α₂8-4 in pCR2.1
   four new 2kb α₂8-4 in pCR2.1

   dig. NQC44 with EcoRI + NotI
   all others with EcoRI only

3-1, 3-2, 2-1, 2-2, 2-3, 2-4, NQC44.

3-2, 2-1, & 2-2 have insertion

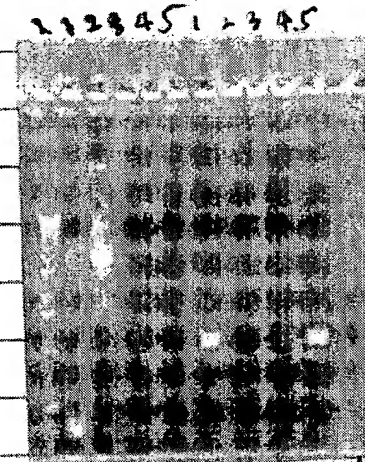
3-2 → NQC45
2-1 → NQC46
2-2 → NQC47

Send NQC44-47 for seq.

2. characterise these clones. by PCR. T7+A2-4-2, Rev+A2-4-2
   ① NQC44, ② NQC45, ③ NQC46
   ④ NQ447, ⑤ Incyte 3343341.
   20 ul RX.

   NQC44 & 45 are very promising
   but 44 is too short.
   45 is right size.

1 2 3 4 5 1 2 3 4 5



Contd. on page 32 Investigator ________ Date 11/16/99

Read and Understood ________ Date 3-6-00

No. 15798-139

Project No. Dn-β / Cu-α2δ Protocol / Experiment No. .... Date 4/7/00

Subject .... Purpose ....

Contd. from page ____

2. Analysis of ~~of~~ Data of hα2δ-4 NT.
They (NQC190-195) are all hα2δ-4 NT.
finished cloning of α2δ-4.

Syn Oligos: A2-4-27 } for add HA on hα2δ-4 CT
A2-4-28

A2-3-29 } add HA on
A2-3-30 } hα2δ-3 CT

Contd. on page 137 Investigator [signature] Date 4/14/00

Read and Understood [initials] Date 4/17/00

ha2d-4b.pep

Text View

```
!!AA_SEQUENCE 1.0

ha2d-4.pep  Length: 1090  April 7, 2000 14:19  Type: P  Check: 9269  ..

       1  MAVALGTRRR DRVKLWADTF GGDLYNTVTK YSGSLLLQKK YKDVESSLKI

      51  EEVDGLELVR KFSEDMENML RRKVEAVQNL VEAAEEADLN HEFNESLVFD

     101  YYNSVLINER DEKGNFVELG AEFLLESNAH FSNLPVNTSI SSVQLPTNVY

     151  NKDPDILNGV YMSEALNAVF VENFQRDPTL TWQYFGSATG FFRIYPGIKW

     201  TPDENGVITF DCRNRGWYIQ AATSPKDIVI LVDVSGSMKG LRMTIAKHTI

     251  TTILDTLGEN DFVNIIAYND YVHYIEPCFK GILVQADRDN REHFKLLVEE

     301  LMVKGVGVVD QALREAFQIL KQFQEAKQGS LCNQAIMLIS DGAVEDYEPV

     351  FEKYNWPDCK VRVFTYLIGR EVSFADRMKW IACNNKGYYT QISTLADTQE

     401  NVMEYLHVLS RPMVINHDHD IIWTEAYMDS KLLSSQAQSL TLLTTVAMPV

     451  FSKKNETRSH GILLGVVGSD VALRELMKLA PRYKLGVHGY AFLNTNNGYI

     501  LSHPDLRPLY REGKKLKPKP NYNSVDLSEV EWEDQAESLR TAMINRETGT

     551  LSMDVKVPMD KGKRVLFLTN DYFFTDISDT PFSLGAVLSR GHGEYILLGN

     601  TSVEEGLHDL LHPDLALAGD WIYCITDIDP DHRKLSQLEA MIRFLTRKDP

     651  DLECDEELVR EVLFDAVVTA PMEAYWTALA LNMSEESEHV VDMAFLGTRA

     701  GLLRSSLFVG SEKVSDRKFL TPEDEASVFT LDRFPLWYRQ ASEHPAGSFV

     751  FNLRWAEGPE SAGEPMVVTA STAVAVTVDK RTAIAAAAGV QMKLEFLQRK

     801  FWAATRQCST VDGPYTQSCE DSDLDCFVID NNGFILISKR SRETGRFLGE

     851  VDGAVLTQLL SMGVFSQVTM YDYQAMCKPS SHHHSAAQPL VSPISAFLTA

     901  TRWLLQELVL FLLEWSVWGS WYDRGAEAKS VFHHSHKHKK QDPLQPCDTE

     951  YPVFVYQPAI REANGIVECG PCQKVFVVQQ IPNSNLLLLV TDPTCDCSIF

    1001  PPVLQEATEV KYNASVKCDR MRSQKLRRRP DSCHAFHPEV RVEADRGWAG

    1051  FSSPNPLCLG LCPCRQEHIG MPMNTPVPVL LGGNIRVYAL
```

Human $\alpha_2\delta$-4 map

April 7, 2000 14:04 ..

```
                                                  HindIII
                                                        |
     AGTCTGCCACTCTCCAACCaGAGGCCCTGGAAGCTTGGGGTCAAGCTCAGTCCTGGGCTCGTCAGCCC
   1 ---------+---------+---------+---------+---------+---------+---------+ 90
     TCAGACGGTGAGAGGTTGGtCTCCGGGACCTTCGAACCCCAGTTCGAGTCAGGACCCGAGCAGTCGGG

                                                    BtsI
                                                      |
     GGCCCCACAACCCTCAGCAGGAGaACCTGCCGAGGACATTCAGCACACAGCAGTGCAGCCGCTGGGTCCTGAGGGTTCTCCGCGTCTCCT
  91 ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 180
     CCGGGGTGTTGGGAGTCGTCCTCtTGGACGGCTCCTGTAAGTCGTGTGTCGTCACGTCGGCGACCCAGGACTCCCAAGAGGCGCAGAGGA

        NcoI                                    Splicing
          |    A2-4-37, -39(Kozak & HindIII)
     GCCCAGGCCATGGCTGTAGCTTTAGGGACAAGGAGGAGGGACAGAGTGAAGCTATGGGCTGACACCTTCGGCGGGGACCTGTATAACAcT
 181 ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 270
     CGGGTCCGGTACCGACATCGAAATCCCTGTTCCTCCTCCCTGTCTCACTTCGATACCCGACTGTGGAAGCCGCCCCTGGACATATTGTgA
a             M  A  V  A  L  G  T  R  R  R  D  R  V  K  L  W  A  D  T  F  G  G  D  L  Y  N  T  -

                           PstI                   BspGI
                             |                      |
     GTGACCAAATACTCAGGCTCTCTCTTGCTGCAgAAGAAGTACAAGGATGTGGAGTCCAGTCTGAAGATCGAGGAGGTGGATGGCTTGGAG
 271 ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 360
     CACTGGTTTATGAGTCCGAGAGAGAACGACGTcTTCTTCATGTTCCTACACCTCAGGTCAGACTTCTAGCTCCTCCACCTACCGAACCTC
a    V  T  K  Y  S  G  S  L  L  L  Q  K  K  Y  K  D  V  E  S  S  L  K  I  E  E  V  D  G  L  E  -

                                                            BspGI
                                                              |
     CTGGTGAGGAAGTTCTCAGAGGACATGGAGAACATGCTGCGGAGGAAAGTCgAGGCGGTCCAgAATCTGGTGGAAGCTGCCGAGGAGGCC
 361 ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 450
     GACCACTCCTTCAAGAGTCTCCTGTACCTCTTGTACGACGCCTCCTTTCAGcTCCGCCAGGTcTTAGACCACCTTCGACGGCTCCTCCGG
a    L  V  R  K  F  S  E  D  M  E  N  M  L  R  R  K  V  E  A  V  Q  N  L  V  E  A  A  E  E  A  -

            EcoRI
       DrdII  |
         |    |  A2-4-31              A-4-23                 A2-4-21          A2-4-22
     GACCTGAACCACGAATTCAATGAATCCCTGGTGTTCGACTATTACAACTCGGTCCTGATCAACGaGAGGGACGAGAAGGGCaACTTcGTG
 451 ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 540
     CTGGACTTGGTGCTTAAGTTACTTAGGGACCACAAGCTGATAATGTTGAGCCAGGACTAGTTGCtCTCCCTGCTCTTCCCGtTGAAgCAC
a    D  L  N  H  E  F  N  E  S  L  V  F  D  Y  Y  N  S  V  L  I  N  E  R  D  E  K  G  N  F  V  -
```

```
          NarI                                                                              PvuII
          |                                                                                 | A2-4-20
     GAGCTGGGCGCCGAGTTCCTCCTGGAGTCCAATGCTCaCTTCAGCAACCTGCCGGtGAACACCTcCATCAGCAGCGTGCAGCTGCCCACC
541  ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 630
     CTCGACCCGCGGCTCAAGGAGGACCTCAGGTTACGAGtGAAGTCGTTGGACGGCCaCTTGTGGAgGTAGTCGTCGCACGTCGACGGGTGG
a    E  L  G  A  E  F  L  L  E  S  N  A  H  F  S  N  L  P  V  N  T  S  I  S  S  V  Q  L  P  T  -
                                A2-4-24

     BsrGI                   DraI         PciI                     BsmI
      |                        |            |                        |
     AACGTGTACAACAAAGACCCAGATATTTTAAATGGAGTCTACATGTCTGAAgCCTTGAATGCTGTCTTCGTGGAGAACTTCCAGAGAGAC
631  ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 720
     TTGCACATGTTGTTTCTGGGTCTATAAAATTTACCTCAGATGTACAGACTTcGGAACTTACGACAGAAGCACCTCTTGAAGGTCTCTCTG
a    N  V  Y  N  K  D  P  D  I  L  N  G  V  Y  M  S  E  A  L  N  A  V  F  V  E  N  F  Q  R  D  -
                                                                                  A2-4-25

                   SspI     BtsI
                    |        |                                       A2-4-19
     CCAACGTTGACCTGGCAATATTTTGGCAGTGCAACTGGATTCTTCAGGAtCTATCCAGGTATAAAATGGACACCTGaTGAGAATGGAGTC
721  ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 810
     GGTTGCAACTGGACCGTTATAAAACCGTCACGTTGACCTAAGAAGTCCTaGATAGGTCCATATTTTACCTGTGGACtACTCTTACCTCAG
a    P  T  L  T  W  Q  Y  F  G  S  A  T  G  F  F  R  I  Y  P  G  I  K  W  T  P  D  E  N  G  V  -

                                                                                    BsrBI
                        SacII                                                   BtrI |
                          |                                                       |  |
     ATTACTTTTGACTGCCGAAACCGCGGCTGGTACATTCAAGCTGCTACTTCTCCCAAGGACATAGTGATTTTGGTGGACGTGAGCGGCAGT
811  ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 900
     TAATGAAAACTGACGGCTTTGGCGCCGACCATGTAAGTTCGACGATGAAGAGGGTTCCTGTATCACTAAAACCACCTGCACTCGCCGTCA
a    I  T  F  D  C  R  N  R  G  W  Y  I  Q  A  A  T  S  P  K  D  I  V  I  L  V  D  V  S  G  S  -

     ATGAAGGGGCTGAGGATGACTATTGCCaAGCACaCCATCACCACCATCTTGGACACCCTGGGGGAGAATGACtTCGTTAATATCATAGCG
901  ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 990
     TACTTCCCCGACTCCTACTGATAACGGtTCGTGtGGTAGTGGTGGTAGAACCTGTGGGACCCCCTCTTACTGaAGCAATTATAGTATCGC
a    M  K  G  L  R  M  T  I  A  K  H  T  I  T  T  I  L  D  T  L  G  E  N  D  F  V  N  I  I  A  -
                                            A2-4-26

                                               BamHI
                                           DraI  |          BspGI
                                             |   |            |
     TACAATGACTACGTCCATTACATCGAGCCTTGTTTTAAAGGGATCCTCGTCCaGGCGGACCGAGACAATCGAGAGCATTTCAAACTgCTG
991  ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 1080
     ATGTTACTGATGCAGGTAATGTAGCTCGGAACAAAATTTCCCTAGGAGCAGGtCCGCCTGGCTCTGTTAGCTCTCGTAAAGTTTGAcGAC
a    Y  N  D  Y  V  H  Y  I  E  P  C  F  K  G  I  L  V  Q  A  D  R  D  N  R  E  H  F  K  L  L  -
                                                         A2-4-32

     GTGGAGGAGTTGATGGTCAAAgGTGTGGGGGTCGTGGACCAAGCCCTGAGAGAAGCCTTCCAGATCCTGAAgCAGTTCCAAGAgGCCAAG
1081 ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 1170
     CACCTCCTCAACTACCAGTTTcCACACCCCCAGCACCTGGTTCGGGACTCTCTTCGGAAGGTCTAGGACTTcGTCAAGGTTCTcCGGTTC
a    V  E  E  L  M  V  K  G  V  G  V  V  D  Q  A  L  R  E  A  F  Q  I  L  K  Q  F  Q  E  A  K  -

                                             NarI        Pfl1108I                           MscI
```

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                                                                A2-4-14
     CAAGGAAGCCTCTGCAACCAGGCCATCATGCTCATCAgCGACgGCGCCGTGGAGGACTACGAGCCGGTGTTTGAGAAGTATAACTGGCCA
1171 ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 1260
     GTTCCTTCGGAGACGTTGGTCCGGTAGTACGAGTAGTcGCTGcCGCGGCACCTCCTGATGCTCGGCCACAAACTCTTCATATTGACCGGT
a    Q  G  S  L  C  N  Q  A  I  M  L  I  S  D  G  A  V  E  D  Y  E  P  V  F  E  K  Y  N  W  P  -
            A2-4-13                 A2-4-12                       A2-4-11

                                                                               SphI
     GACTGTAAGGTCCGAGTTTTCACTTACCTCATTGGGAGAGAAGTGTCTTTTGCTGACCGCATGAAGTGGATTGCATGCAACAACAAAGGc
1261 ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 1350
     CTGACATTCCAGGCTCAAAAGTGAATGGAGTAACCCTCTCTTCACAGAAAACGACTGGCGTACTTCACCTAACGTACGTTGTTGTTTCCg
a    D  C  K  V  R  V  F  T  Y  L  I  G  R  E  V  S  F  A  D  R  M  K  W  I  A  C  N  N  K  G  -

        BglII                                           PmlI         NcoI
           A2-4-29                                                            A2-4-15
     tACTACACGCAGATCTCAACGCTGGCGGACACCCAGGAGAACGTGATGGAATACCTGCACGTGCTCAGCCGCCCCATGGTCATCAACCAC
1351 ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 1440
     aTGATGTGCGTCTAGAGTTGCGACCGCCTGTGGGTCCTCTTGCACTACCTTATGGACGTGCACGAGTCGGCGGGGTACCAGTAGTTGGTG
a    Y  Y  T  Q  I  S  T  L  A  D  T  Q  E  N  V  M  E  Y  L  H  V  L  S  R  P  M  V  I  N  H  -
                                                                                  A2-4-17

           BspGI    StuI                                           BtsI           MscI
                                          A2-4-18
     GACCACGACATCATCTGGACAGAGGCCTACATGGACAGCAAGCTCCTCAGCTCGCAGGCTCAGAGCCTGACACTGCTCACCACTGTGGCC
1441 ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 1530
     CTGGTGCTGTAGTAGACCTGTCTCCGGATGTACCTGTCGTTCGAGGAGTCGAGCGTCCGAGTCTCGGACTGTGACGAGTGGTGACACCGG
a    D  H  D  I  I  W  T  E  A  Y  M  D  S  K  L  L  S  S  Q  A  Q  S  L  T  L  L  T  T  V  A  -
                                                     A2-4-16

                                NcoI BsmI
     ATGCCAGTCTTCAGCAAGAAGAACGAAACGCGATCCCATGGCATTCTCCTGGGTGTGGTGGGCTCAGATGTGGCCCTGAGAGAGCTGATG
1531 ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 1620
     TACGGTCAGAAGTCGTTCTTCTTGCTTTGCGCTAGGGTACCGTAAGAGGACCCACACCACCCGAGTCTACACCGGGACTCTCTCGACTAC
a    M  P  V  F  S  K  K  N  E  T  R  S  H  G  I  L  L  G  V  V  G  S  D  V  A  L  R  E  L  M  -

       NarI     HindIII
     AAGCTGGCGCCCCGGTACAAGCTTGGAGTGCACGGATACGCCTTTCTGAACACCAACAATGGCTACATCCTCTCCCATCCCGACCTCCGG
1621 ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 1710
     TTCGACCGCGGGGCCATGTTCGAACCTCACGTGCCTATGCGGAAAGACTTGTGGTTGTTACCGATGTAGGAGAGGGTAGGGCTGGAGGCC
a    K  L  A  P  R  Y  K  L  G  V  H  G  Y  A  F  L  N  T  N  N  G  Y  I  L  S  H  P  D  L  R  -
                           A2-4-30
```

```
          BsrGI
          |
          CCCCTGTACAGAGAGGGGAAGAAACTAAAACCCAAACCTAACTACAACAGTGTGGATCTCTCCGAAGTGGAGTGGGAAGACCAGGCTGAA
     1711 ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 1800
          GGGGACATGTCTCTCCCCTTCTTTGATTTTGGGTTTGGATTGATGTTGTCACACCTAGAGAGGCTTCACCTCACCCTTCTGGTCCGACTT
a         P  L  Y  R  E  G  K  K  L  K  P  K  P  N  Y  N  S  V  D  L  S  E  V  E  W  E  D  Q  A  E  -

          TCTCTGAGAACAGCCATGATCAATAGGGAAACAGGTACTCTCTCGATGGATGTGAAGGTTCCGATGGATAAAGGGAAGCGAGTTCTTTTC
     1801 ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 1890
          AGAGACTCTTGTCGGTACTAGTTATCCCTTTGTCCATGAGAGAGCTACCTACACTTCCAAGGCTACCTATTTCCCTTCGCTCAAGAAAAG
a         S  L  R  T  A  M  I  N  R  E  T  G  T  L  S  M  D  V  K  V  P  M  D  K  G  K  R  V  L  F  -

                                                                          SmaI
                                                                           |
          CTGACCAATGACTACTTCTTCACGGACATCAGCGACACCCCTTTCAGTTTGGGGGTGGTGCTGTCCCGGGGCCACGGAGAATACATCCTT
     1891 ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 1980
          GACTGGTTACTGATGAAGAAGTGCCTGTAGTCGCTGTGGGGAAAGTCAAACCCCCACCACGACAGGGCCCCGGTGCCTCTTATGTAGGAA
a         L  T  N  D  Y  F  F  T  D  I  S  D  T  P  F  S  L  G  V  V  L  S  R  G  H  G  E  Y  I  L  -

                 BtrI           StuI
                  |              |
          CTGGGGAACACGTCTGTGGAAGAAGGCCTGCATGACTTGCTTCACCCAGACCTGGCCCTGGCCGGTGACTGGATCTACTGCATCACAGAT
     1981 ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 2070
          GACCCCTTGTGCAGACACCTTCTTCCGGACGTACTGAACGAAGTGGGTCTGGACCGGGACCGGCCACTGACCTAGATGACGTAGTGTCTA
a         L  G  N  T  S  V  E  E  G  L  H  D  L  L  H  P  D  L  A  L  A  G  D  W  I  Y  C  I  T  D  -

          ATTGACCCAGACCACCGGAAGCTCAGCCAGCTAGAGGCCATGATCCGCTTCCTCACCAGGAAGGACCCAGACCTGGAGTGTGACGAGGAG
     2071 ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 2160
          TAACTGGGTCTGGTGGCCTTCGAGTCGGTCGATCTCCGGTACTAGGCGAAGGAGTGGTCCTTCCTGGGTCTGGACCTCACACTGCTCCTC
a         I  D  P  D  H  R  K  L  S  Q  L  E  A  M  I  R  F  L  T  R  K  D  P  D  L  E  C  D  E  E  -

                                              NcoI          BspGI              PciI
                                               |              |                  |
          CTGGTCCGGGAGGTGCTGTTTGACGCGGTGGTGACAGCCCCCATGGAAGCCTACTGGACAGCGCTGGCCCTCAACATGTCCGAGGAGTCT
     2161 ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 2250
          GACCAGGCCCTCCACGACAAACTGCGCCACCACTGTCGGGGGTACCTTCGGATGACCTGTCGCGACCGGGAGTTGTACAGGCTCCTCAGA
a         L  V  R  E  V  L  F  D  A  V  V  T  A  P  M  E  A  Y  W  T  A  L  A  L  N  M  S  E  E  S  -

            PmlI                   SmaI
             |                      |
          GAACACGTGGTGGACATGGCCTTCCTGGGCACCCGGGCTGGCCTCCTGAGAAGCAGCTTGTTCGTGGGCTCCGAGAAGGTCTCCGACAGG
     2251 ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 2340
          CTTGTGCACCACCTGTACCGGAAGGACCCGTGGGCCCGACCGGAGGACTCTTCGTCGAACAAGCACCCGAGGCTCTTCCAGAGGCTGTCC
a         E  H  V  V  D  M  A  F  L  G  T  R  A  G  L  L  R  S  S  L  F  V  G  S  E  K  V  S  D  R  -
```

```
                                   BspGI                          [redacted]   StuI
      A2-4-34
      AAGTTCCTGACACCTGAGGACGAGGCCAGCGTGTTCACCCTGGACCGCTTCCCGCTGTGGT[redacted]GCCAGGCCTCAGAGCATCCTGCTGGC
2341  ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 2430
      TTCAAGGACTGTGGACTCCTGCTCCGGTCGCACAAGTGGGACCTGGCGAAGGGCGACACCATGGCGGTCCGGAGTCTCGTAGGACGACCG
a     K  F  L  T  P  E  D  E  A  S  V  F  T  L  D  R  F  P  L  W  Y  R  Q  A  S  E  H  P  A  G  -
         Antigen1

                                                             NcoI                PvuII
      AGCTTCGTCTTCAACCTCCGCTGGGCAGAAGGACCAGAAAGTGCGGGTGAACCCATGGTGGTGACGGCAAGCACAGCTGTGGCGGTGACC
2431  ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 2520
      TCGAAGCAGAAGTTGGAGGCGACCCGTCTTCCTGGTCTTTCACGCCCACTTGGGTACCACCACTGCCGTTCGTGTCGACACCGCCACTGG
a     S  F  V  F  N  L  R  W  A  E  G  P  E  S  A  G  E  P  M  V  V  T  A  S  T  A  V  A  V  T  -

                           SacII
                       PstI              EcoRI                                       BtsI
                                 A2-4-6
      GTGGACAAGAGGACAGCCATTGCTGCAGCCGCGGGCGTCCAAATGAAGCTGGAATTCCTCCAGCGCAAATTCTGGGCGGCAACGCGGCAG
2521  ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 2610
      CACCTGTTCTCCTGTCGGTAACGACGTCGGCGCCCGCAGGTTTACTTCGACCTTAAGGAGGTCGCGTTTAAGACCCGCCGTTGCGCCGTC
a     V  D  K  R  T  A  I  A  A  A  A  G  V  Q  M  K  L  E  F  L  Q  R  K  F  W  A  A  T  R  Q  -
                                                                        A2-4-2

                                                       BspGI
               A2-4-7
      TGCAGCACTGTGGATGGGCCGTGCACACAGAGCTGCGAGGACAGTGATCTGGACTGCTTCGTCATCGACAACAACGGGTTCATTCTGATC
2611  ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 2700
      ACGTCGTGACACCTACCCGGCACGTGTGTCTCGACGCTCCTGTCACTAGACCTGACGAAGCAGTAGCTGTTGTTGCCCAAGTAAGACTAG
a     C  S  T  V  D  G  P  C  T  Q  S  C  E  D  S  D  L  D  C  F  V  I  D  N  N  G  F  I  L  I  -

                                                                   PvuII
                                                                                  A2-4-42
      TCCAAGAGGTCCCGAGAGACGGGAAGATTTCTGGGGGAGGTggaTGGTGCTGTCCTGACCCAGCTGCTCAGCATGGGGGTGTTCAGCCAA
2701  ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 2790
      AGGTTCTCCAGGGCTCTCTGCCCTTCTAAAGACCCCCTCCAcctACCACGACAGGACTGGGTCGACGAGTCGTACCCCCACAAGTCGGTT
a     S  K  R  S  R  E  T  G  R  F  L  G  E  V  D  G  A  V  L  T  Q  L  L  S  M  G  V  F  S  Q  -
           A2-4-10, -3(sh)                                                        A2-4-50

                                            [redacted]
      GTGACT[redacted]TATGACTATCAGGCCATGTGCAAA[redacted]TCGAGTCACCACCACAGTGCAGCCCAGCCCCTGGTCAGCCCAATTTCTGCCTTC
2791  ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 2880
      CACTGATACATACTGATAGTCCGGTACACGTTTGGGAGCTCAGTGGTGGTGTCACGTCGGGTCGGGGACCAGTCGGGTTAAAGACGGAAG
a     V  T  M  Y  D  Y  Q  A  M  C  K  P  S  S  H  H  H  S  A  A  Q  P  L  V  S  P  I  S  A  F  -
                                                          A2-4-9, -4(Sh)
```

```
                                PstI
                                |
       TTGACGGCGACCAGGTGGCTGCTGCAGGAGCTGGTGCTGTTCCTGCTGGAGTGGAGTGTCTGGGGCTCCTGGTACGACAGAGGGGCcgaG
  2881 ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 2970
       AACTGCCGCTGGTCCACCGACGACGTCCTCGACCACGACAAGGACGACCTCACCTCACAGACCCCGAGGACCATGCTGTCTCCCCGgctC
a      L  T  A  T  R  W  L  L  Q  E  L  V  L  F  L  L  E  W  S  V  W  G  S  W  Y  D  R  G  A  E  -

                                                                 PstI                      NgoAIV
                                                                 |                              |
       GCCAAAAGTGTCTTCCATCACTCCCACAAACACAagaagCAGGACCCGCTGCagcCCTGcgacaCGgagtACCccgTGTtcGTGTAccaG
  2971 ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 3060
       CGGTTTTCACAGAAGGTAGTGAGGGTGTTTGTGTtcttcGTCCTGGGCGACGtcgGGACgctgtGCctcaTGGggcACAagCACATggtC
a      A  K  S  V  F  H  H  S  H  K  H  K  K  Q  D  P  L  Q  P  C  D  T  E  Y  P  V  F  V  Y  Q  -

                                             ApaI
                                             |
       CCGGccaTCCGGGaggCCAACGGGATCGTGGAGTGCGGGCCCTGCCAGAAGGTATTTGTGGTGCAGCAGATTCCCAACAGTAACCTCCTC
  3061 ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 3150
       GGCCggtAGGCCCtccGGTTGCCCTAGCACCTCACGCCCGGGACGGTCTTCCATAAACACCACGTCGTCTAAGGGTTGTCATTGGAGGAG
a      P  A  I  R  E  A  N  G  I  V  E  C  G  P  C  Q  K  V  F  V  V  Q  Q  I  P  N  S  N  L  L  -

                                    PstI                 PstI
                                    |                    |  A2-4-33
       CTCCTGGTGACAGACCCCACCTGTGACTGCAGCATCTTCCCACCAGTGCTGCAGGAGGCGACAGAAGTCAAATATAATGCCTCTGTCAAA
  3151 ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 3240
       GAGGACCACTGTCTGGGGTGGACACTGACGTCGTAGAAGGGTGGTCACGACGTCCTCCGCTGTCTTCAGTTTATATTACGGAGACAGTTT
a      L  L  V  T  D  P  T  C  D  C  S  I  F  P  P  V  L  Q  E  A  T  E  V  K  Y  N  A  S  V  K  -

                             NgoAIV                                       Splicing
                             |
       TGTGACCGGATGCGCTCCCAGaagctccGCCGGCGACCAGACTCCTGCCACGCCTTCCATCCAGAGGTGCGGGTTGAGGCGGATCGAGGG
  3241 ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 3330
       ACACTGGCCTACGCGAGGGTCttcgaggCGGCCGCTGGTCTGAGGACGGTGCGGAAGGTAGGTCTCCACGCCCAACTCCGCCTAGCTCCC
a      C  D  R  M  R  S  Q  K  L  R  R  R  P  D  S  C  H  A  F  H  P  E  V  R  V  E  A  D  R  G  -
                                                                                Antigen2

                                                                PstI
                                                                |
       TGGGCTGGATTTTCATCCCCAAACCCTCTGTGCCTGGGTCTGTGCCCCTGCAGACAGGAGCATATAGGGATGCCAATGAACACACCTGTG
  3331 ---------+---------+---------+---------+---------+---------+---------+---------+---------+ 3420
       ACCCGACCTAAAAGTAGGGGTTTGGGAGACACGGACCCAGACACGGGGACGTCTGTCCTCGTATATCCCTACGGTTACTTGTGTGGACAC
a      W  A  G  F  S  S  P  N  P  L  C  L  G  L  C  P  C  R  Q  E  H  I  G  M  P  M  N  T  P  V  -

       CCTGTGCTTCTCGGGGGAAACATTCGCGTTTATGCCCTGTGACACTGTGATATAATAAGAAACAGA
  3421 ---------+---------+---------+---------+---------+---------+------ 3486
       GGACACGAAGAGCCCCCTTTGTAAGCGCAAATACGGGACACTGTGACACTATATTATTCTTTGTCT
a      P  V  L  L  G  G  N  I  R  V  Y  A  L  *                        -
                             A2-4-38, -8                   A2-4-5
                             A2-4-28(HA)
```

Enzymes that do cut and were not excluded:

ApaI	BamHI	BglII	BsmI	BspGI	BsrBI	BsrGI	BtrI	BtsI	DraI	DrdII	EcoRI
HindIII	KpnI	MscI	NarI	NcoI	NgoAIV	PciI	Pfl1108I	PmlI	PstI	PvuII	SacII
SmaI	SphI	SspI	StuI	XhoI							

Enzymes that do not cut:

BsbI	BssHII	BssSI	BstZ17I	ClaI	EagI	EcoRV	HpaI	Kpn2I	MluI	MunI	NdeI
NheI	NotI	NruI	NsiI	NspV	PacI	PinAI	PsiI	PvuI	RcaI	SacI	SalI
ScaI	SnaBI	SpeI	SrfI	SunI	VspI	XbaI					

DNA Sequence:

```
   1 CAGGTACATT CAGCAGAGCC CAAGTCTGCC ACTCTCCAAC CaGAGGCCCT
  51 GGAAGCTTGG GGTCAAGCTC AGTCCTGGGC TCGTCAGCCC GGCCCCACAA
 101 CCCTCAGCAG GAGaACCTGC CGAGGACATT CAGCACACAG CAGTGCAGCC
 151 GCTGGGTCCT GAGGGTTCTC CGCGTCTCCT GCCCAGGCCA TGGCTGTAGC
 201 TTTAGGGACA AGGAGGAGGG ACAGAGTGAA GCTATGGGCT GACACCTTCG
 251 GCGGGGACCT GTATAACAcT GTGACCAAAT ACTCAGGCTC TCTCTTGCTG
 301 CAgAAGAAGT ACAAGGATGT GGAGTCCAGT CTGAAGATCG AGGAGGTGGA
 351 TGGCTTGGAG CTGGTGAGGA AGTTCTCAGA GGACATGGAG AACATGCTGC
 401 GGAGGAAAGT CgAGGCGGTC CAgAATCTGG TGGAAGCTGC CGAGGAGGCC
 451 GACCTGAACC ACGAATTCAA TGAATCCCTG GTGTTCGACT ATTACAACTC
 501 GGTCCTGATC AACGaGAGGG ACGAGAAGGG CaACTTcGTG GAGCTGGGCG
 551 CCGAGTTCCT CCTGGAGTCC AATGCTCaCT TCAGCAACCT GCCGGtGAAC
 601 ACCTcCATCA GCAGCGTGCA GCTGCCCACC AACGTGTACA ACAAAGACCC
 651 AGATATTTTA AATGGAGTCT ACATGTCTGA AgCCTTGAAT GCTGTCTTCG
 701 TGGAGAACTT CCAGAGAGAC CCAACGTTGA CCTGGCAATA TTTTGGCAGT
 751 GCAACTGGAT TCTTCAGGAt CTATCCAGGT ATAAAATGGA CACCTGaTGA
 801 GAATGGAGTC ATTACTTTTG ACTGCCGAAA CCGCGGCTGG TACATTCAAG
 851 CTGCTACTTC TCCCAAGGAC ATAGTGATTT TGGTGGACGT GAGCGGCAGT
 901 ATGAAGGGGC TGAGGATGAC TATTGCCaAG CACaCCATCA CCACCATCTT
 951 GGACACCCTG GGGGAGAATG ACtTCGTTAA TATCATAGCG TACAATGACT
1001 ACGTCCATTA CATCGAGCCT TGTTTTAAAG GGATCCTCGT CCaGGCGGAC
1051 CGAGACAATC GAGAGCATTT CAAACTgCTG GTGGAGGAGT TGATGGTCAA
1101 AgGTGTGGGG GTCGTGGACC AAGCCCTGAG AGAAGCCTTC CAGATCCTGA
1151 AgCAGTTCCA AGAgGCCAAG CAAGGAAGCC TCTGCAACCA GGCCATCATG
1201 CTCATCAgCG ACgGCGCCGT GGAGGACTAC GAGCCGGTGT TTGAGAAGTA
1251 TAACTGGCCA GACTGTAAGG TCCGAGTTTT CACTTACCTC ATTGGGAGAG
1301 AAGTGTCTTT TGCTGACCGC ATGAAGTGGA TTGCATGCAA CAACAAAGGc
1351 tACTACACGC AGATCTCAAC GCTGGCGGAC ACCCAGGAGA ACGTGATGGA
1401 ATACCTGCAC GTGCTCAGCC GCCCCATGGT CATCAACCAC GACCACGACA
1451 TCATCTGGAC AGAGGCCTAC ATGGACAGCA AGCTCCTCAG CTCGCAGGCT
1501 CAGAGCCTGA CACTGCTCAC CACTGTGGCC ATGCCAGTCT TCAGCAAGAA
1551 GAACGAAACG CGATCCCATG GCATTCTCCT GGGTGTGGTG GGCTCAGATG
1601 TGGCCCTGAG AGAGCTGATG AAGCTGGCGC CCCGGTACAA GCTTGGAGTG
1651 CACGGATACG CCTTTCTGAA CACCAACAAT GGCTACATCC TCTCCCATCC
1701 CGACCTCCGG CCCCTGTACA GAGAGGGGAA GAAACTAAAA CCCAAACCTA
1751 ACTACAACAG TGTGGATCTC TCCGAAGTGG AGTGGGAAGA CCAGGCTGAA
1801 TCTCTGAGAA CAGCCATGAT CAATAGGGAA ACAGGTACTC TCTCGATGGA
1851 TGTGAAGGTT CCGATGGATA AAGGGAAGCG AGTTCTTTTC CTGACCAATG
1901 ACTACTTCTT CACGGACATC AGCGACACCC CTTTCAGTTT GGGGGCGGTG
1951 CTGTCCCGGG GCCACGGAGA ATACATCCTT CTGGGGAACA CGTCTGTGGA
2001 AGAAGGCCTG CATGACTTGC TTCACCCAGA CCTGGCCCTG GCCGGTGACT
2051 GGATCTACTG CATCACAGAT ATTGACCCAG ACCACCGGAA GCTCAGCCAG
2101 CTAGAGGCCA TGATCCGCTT CCTCACCAGG AAGGACCCAG ACCTGGAGTG
2151 TGACGAGGAG CTGGTCCGGG AGGTGCTGTT TGACGCGGTG GTGACAGCCC
2201 CCATGGAAGC CTACTGGACA GCGCTGGCCC TCAACATGTC CGAGGAGTCT
2251 GAACACGTGG TGGACATGGC CTTCCTGGGC ACCCGGGCTG GCCTCCTGAG
2301 AAGCAGCTTG TTCGTGGGCT CCGAGAAGGT CTCCGACAGG AAGTTCCTGA
2351 CACCTGAGGA CGAGGCCAGC GTGTTCACCC TGGACCGCTT CCCGCTGTGG
2401 TACCGCCAGG CCTCAGAGCA TCCTGCTGGC AGCTTCGTCT TCAACCTCCG
2451 CTGGGCAGAA GGACCAGAAA GTGCGGGTGA ACCCATGGTG GTGACGGCAA
2501 GCACAGCTGT GGCGGTGACC GTGGACAAGA GGACAGCCAT TGCTGCAGCC
2551 GCGGGCGTCC AAATGAAGCT GGAATTCCTC CAGCGCAAAT TCTGGGCGGC
2601 AACGCGGCAG TGCAGCACTG TGGATGGGCC GTACACACAG AGCTGCGAGG
2651 ACAGTGATCT GGACTGCTTC GTCATCGACA ACAACGGGTT CATTCTGATC
2701 TCCAAGAGGT CCCGAGAGAC GGGAAGATTT CTGGGGGAGG TggaTGGTGC
2751 TGTCCTGACC CAGCTGCTCA GCATGGGGGT GTTCAGCCAA GTGACTATGT
2801 ATGACTATCA GGCCATGTGC AAACCCTCGA GTCACCACCA CAGTGCAGCC
2851 CAGCCCCTGG TCAGCCCAAT TTCTGCCTTC TTGACGGCGA CCAGGTGGCT
2901 GCTGCAGGAG CTGGTGCTGT TCCTGCTGGA GTGGAGTGTC TGGGGCTCCT
2951 GGTACGACAG AGGGGCcgaG GCCAAAAGTG TCTTCCATCA CTCCCACAAA
3001 CACAagaagC AGGACCCGCT GCagcCCTGc gacaCGgagt ACCccgTGTt
3051 cGTGTAccaG CCGGccaTCC GGGaggCCAA CGGGATCGTG GAGTGCGGGC
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3101 CCTGCCAGAA GGTATTTGTG GTGCAGCAGA TTCCCAACAG TAACCTCCTC
3151 CTCCTGGTGA CAGACCCCAC CTGTGACTGC AGCATCTTCC CACCAGTGCT
3201 GCAGGAGGCG ACAGAAGTCA AATATAATGC CTCTGTCAAA TGTGACCGGA
3251 TGCGCTCCCA GaagctccGC CGGCGACCAG ACTCCTGCCA CGCCTTCCAT
3301 CCAGAGGTGC GGGTTGAGGC GGATCGAGGG TGGGCTGGAT TTTCATCCCC
3351 AAACCCTCTG TGCCTGGGTC TGTGCCCCTG CAGACAGGAG CATATAGGGA
3401 TGCCAATGAA CACACCTGTG CCTGTGCTTC TCGGGGGAAA CATTCGCGTT
3451 TATGCCCTGT GACACTGTGA TATAATAAGA AACAGA
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Protein Sequence:

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      M A V A L G T R R R D R V K L W A D T F G G D L Y N T
V T K Y S G S L L L Q K K Y K D V E S S L K I E E V D G L E
L V R K F S E D M E N M L R R K V E A V Q N L V E A A E E A
D L N H E F N E S L V F D Y Y N S V L I N E R D E K G N F V
E L G A E F L L E S N A H F S N L P V N T S I S S V Q L P T
N V Y N K D P D I L N G V Y M S E A L N A V F V E N F Q R D
P T L T W Q Y F G S A T G F F R I Y P G I K W T P D E N G V
I T F D C R N R G W Y I Q A A T S P K D I V I L V D V S G S
M K G L R M T I A K H T I T T I L D T L G E N D F V N I I A
Y N D Y V H Y I E P C F K G I L V Q A D R D N R E H F K L L
V E E L M V K G V G V V D Q A L R E A F Q I L K Q F Q E A K
Q G S L C N Q A I M L I S D G A V E D Y E P V F E K Y N W P
D C K V R V F T Y L I G R E V S F A D R M K W I A C N N K G
Y Y T Q I S T L A D T Q E N V M E Y L H V L S R P M V I N H
D H D I I W T E A Y M D S K L L S S Q A Q S L T L L T T V A
M P V F S K K N E T R S H G I L L G V V G S D V A L R E L M
K L A P R Y K L G V H G Y A F L N T N N G Y I L S H P D L R
P L Y R E G K K L K P K P N Y N S V D L S E V E W E D Q A E
S L R T A M I N R E T G T L S M D V K V P M D K G K R V L F
L T N D Y F F T D I S D T P F S L G A V L S R G H G E Y I L
L G N T S V E E G L H D L L H P D L A L A G D W I Y C I T D
I D P D H R K L S Q L E A M I R F L T R K D P D L E C D E E
L V R E V L F D A V V T A P M E A Y W T A L A L N M S E E S
E H V V D M A F L G T R A G L L R S S L F V G S E K V S D R
K F L T P E D E A S V F T L D R F P L W Y R Q A S E H P A G
S F V F N L R W A E G P E S A G E P M V V T A S T A V A V T
V D K R T A I A A A A G V Q M K L E F L Q R K F W A A T R Q
C S T V D G P Y T Q S C E D S D L D C F V I D N N G F I L I
S K R S R E T G R F L G E V D G A V L T Q L L S M G V F S Q
V T M Y D Y Q A M C K P S S H H H S A A Q P L V S P I S A F
L T A T R W L L Q E L V L F L L E W S V W G S W Y D R G A E
A K S V F H H S H K H K K Q D P L Q P C D T E Y P V F V Y Q
P A I R E A N G I V E C G P C Q K V F V V Q Q I P N S N L L
L L V T D P T C D C S I F P P V L Q E A T E V K Y N A S V K
C D R M R S Q K L R R R P D S C H A F H P E V R V E A D R G
W A G F S S P N P L C L G L C P C R Q E H I G M P M N T P V
P V L L G G N I R V Y A L
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Comparison of hα2δ-4.pep with hα2δ-3.pep:

April 7, 2000 14:19

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Percent Similarity: 69.172   Percent Identity: 60.133

              .         .         .         .         .
   1 ......................MAVALGTRRRDR.......VKLWADTFG 21
                           :  |||   |         |||||  ||
   1 MAGPGSPRRASRGASALLAAALLYAALGDVVRSEQQIPLSVVKLWASAFG 50
              .         .         .         .         .
  22 GDLYNTVTKYSGSLLLQKKYKDVESSLKIEEVDGLELVRKFSEDMENMLR 71
     |:: .   ||||| |||||||: |   .|||:|||:||:| ...|| |
  51 GEIKSIAAKYSGSQLLQKKYKEYEKDVAIEEIDGLQLVKKLAKNMEEMFH 100
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              .         .         .         .         .
 72 RKVEAVQNLVEAAEEADLNHEFNESLVFDYYNSVLINERDEKGNFVELGA 121
    :| |||. |||||||| | |||.  | ::|:|.|||||||. |||.|||
101 KKSEAVRRLVEAAEEAHLKHEFDADLQYEYFNAVLINERDKDGNFLELGK 150

              .         .         .         .         .
122 EFLLESNAHFSNLPVNTSISSVQLPTNVYNKDPDILNGVYMSEALNAVFV 171
    ||:|  | ||.||||| |:| ||.|||.||||| |.|||| ||.|| |||
151 EFILAPNDHFNNLPVNISLSDVQVPTNMYNKDPAIVNGVYWSESLNKVFV 200

              .         .         .         .         .
172 ENFQRDPTLTWQYFGSATGFFRIYPGIKWTPDENGVITFDCRNRGWYIQA 221
    :|| |||.| ||||||| |||| |||||| ||||||| |||||| |||||
201 DNFDRDPSLIWQYFGSAKGFFRQYPGIKWEPDENGVIAFDCRNRKWYIQA 250

              .         .         .         .         .
222 ATSPKDIVILVDVSGSMKGLRMTIAKHTITTILDTLGENDFVNIIAYNDY 271
    ||||||:||||||||||||||:|||| |:..||||||:.|| ||||||:
251 ATSPKDVVILVDVSGSMKGLRLTIAKQTVSSILDTLGDDDFFNIIAYNEE 300

              .         .         .         .         .
272 VHYIEPCFKGILVQADRDNREHFKLLVEELMVKGVGVVDQALREAFQILK 321
    .||:|||  | |||||| |:|||:  .:.|  ||:|..| || ||| ||
301 LHYVEPCLNGTLVQADRTNKEHFREHLDKLFAKGIGMLDIALNEAFNILS 350

              .         .         .         .         .
322 QFQEAKQGSLCNQAIMLISDGAVEDYEPVFEKYNWPDCKVRVFTYLIGRE 371
     |     |||:|.||||||.||||: |: :| |||||| |||:||||||||
351 DFNHTGQGSICSQAIMLITDGAVDTYDTIFAKYNWPDRKVRIFTYLIGRE 400

              .         .         .         .         .
372 VSFADRMKWIACNNKGYYTQISTLADTQENVMEYLHVLSRPMVINHDHDI 421
    .|||  :||.|| |||::|||||||| |||||||||||||| ||. :||:
401 AAFADNLKWMACANKGFFTQISTLADVQENVMEYLHVLSRPKVIDQEHDV 450

              .         .         .         .         .
422 IWTEAYMDSKLLSSQAQSLT......LLTTVAMPVFSKKNETRSHGILLG 465
    :|||||.|| |   ||| ||      |:||||||||||.||||| |||||
451 VWTEAYIDSTL..PQAQKLTDDQGPVLMTTVAMPVFSKQNETRSKGILLG 498

              .         .         .         .         .
466 VVGSDVALRELMKLAPRYKLGVHGYAFLNTNNGYILSHPDLRPLYREGKK 515
    |||.|| .:||:|  |:||||:|||||  |||||||.||:|| || ||||
499 VVGTDVPVKELLKTIPKYKLGIHGYAFAITNNGYILTHPELRLLYEEGKK 548

              .         .         .         .         .
516 LKPKPNYNSVDLSEVEWEDQAESLRTAMINRETGTLSMDVKVPMDKGKRV 565
     : ||||.|||||||||||. : || ||:||.||  ||:||  .||||||
549 .RRKPNYSSVDLSEVEWEDRDDVLRNAMVNRKTGKFSMEVKKTVDKGKRV 597

              .         .         .         .         .
566 LFLTNDYFFTDISDTPFSLGAVLSRGHGEYILLGNTSVEEGLHDLLHPDL 615
    | :||||::|||  ||||||  ||||||.|   || .:||||||| |||.
598 LVMTNDYYYTDIKGTPFSLGVALSRGHGKYFFRGNVTIEEGLHDLEHPDV 647

              .         .         .         .         .
616 ALAGDWIYCITDIDPDHRKLSQLEAMIRFLTRKDPDLECDEELVREVLFD 665
    .||: | || ||: |:|| ||||||.  :|  |:| |:||.||:.|||||
648 SLADEWSYCNTDLHPEHRHLSQLEAIKLYLKGKEPLLQCDKELIQEVLFD 697

              .         .         .         .         .
666 AVVTAPMEAYWTALALNMSEESEHVVDMAFLGTRAGLLRSSLFVGSEKVS 715
    |||.||.|||||.|||| || |:  |:.||||||  || | .||||.|...
698 AVVSAPIEAYWTSLALNKSENSDKGVEVAFLGTRTGLSRINLFVGAEQLT 747

              .         .         .         .         .
716 DRKFLTPEDEASVFTLDRFPLWYRQASEHPAGSFVFNLRWAEGPESAGEP 765
    .. ||   |. .:|  |  ||||||.|.|   ||||:.: ..  ||     .
748 NQDFLKAGDKENIFNADHFPLWYRRAAEQIPGSFVYSIPFSTGP..VNKS 795

              .         .         .         .         .
766 MVVTASTAVAVTVDKRTAIAAAAGVQMKLEFLQRKFWAATRQCSTVDGPY 815
     ||||||.: .  :::. : || |:|||||| ||||| |.|||...||
796 NVVTASTSIQLLDERKSPVVAAVGIQMKLEFFQRKFWTASRQCASLDGKC 845

              .         .         .         .         .
816 TQSCEDSDLDCFVIDNNGFILISKRSRETGRFLGEVDGAVLTQLLSMGVF 865
    . ||:|  ..|:.||||||||:|.   :|| | ||::|||: .||.|| |
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 846 SISCDDETVNCYLIDNNGFILVSEDYTQTGDFFGEIEGAVMNKLLTMGSF 895

              .         .         .         .         .
 866 SQVTMYDYQAMCKPSSHHHSAAQPLVSPISAFLTATRWLLQELVLFLLEW 915
      .:|:|||||||: .      |  |. | .|||.| :|:: ||||||.|.
 896 KRITLYDYQAMCRANKESSDGAHGLLDPYNAFLSAVKWIMTELVLFLVEF 945

              .         .         .         .         .
 916 SVWGSWYDRGAEAKSVFHHSHKHKKQDPLQPCDTEYPVFVYQPAIREANG 965
     ..  ||:     ||.        | .  |:||||||| || :  |:|  |
 946 NLC.SWWHSDMTAKA.......QKLKQTLEPCDTEYPAFVSERTIKETTG 987

              .         .         .         .         .
 966 IVECGPCQKVFVVQQIPNSNLLLLVTDPTCDCSIFPPVLQEATEVKYNAS 1015
      : |  | | ||:||||.||| :.| | .| |    |:     |::|| |
 988 NIACEDCSKSFVIQQIPSSNLFMVVVDSSCLCESVAPITMAPIEIRYNES 1037

              .         .         .         .         .
1016 VKCDRMRSQKLRRRPDSCHAFHPEVRVEADRGWAGFSSPN.....PLCLG 1060
     .||:|::.||:||||:||| ||||       |     .       || |
1038 LKCERLKAQKIRRRPESCHGFHPEENARECGGAPSLQAQTVLLLLPLLLM 1087

              .         .         .
1061 LCPCRQEHIGMPMNTPVPVLLGGNIRVYAL 1090
     |
1088 LFSR.......................... 1091
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